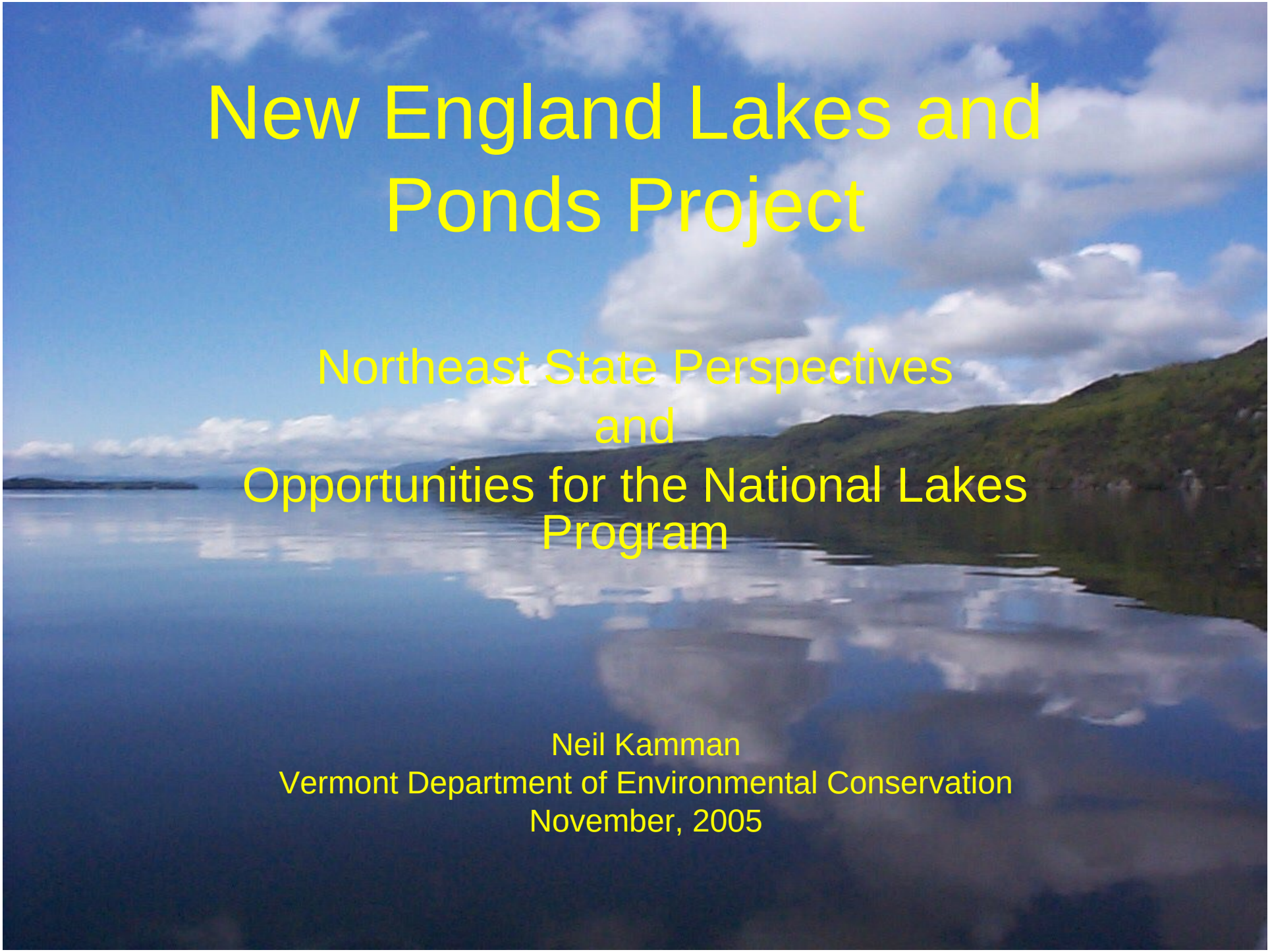

New England Lakes and Ponds Project

Northeast State Perspectives and Opportunities for the National Lakes Program

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Vermont Department of Environmental Conservation
November, 2005

Outline

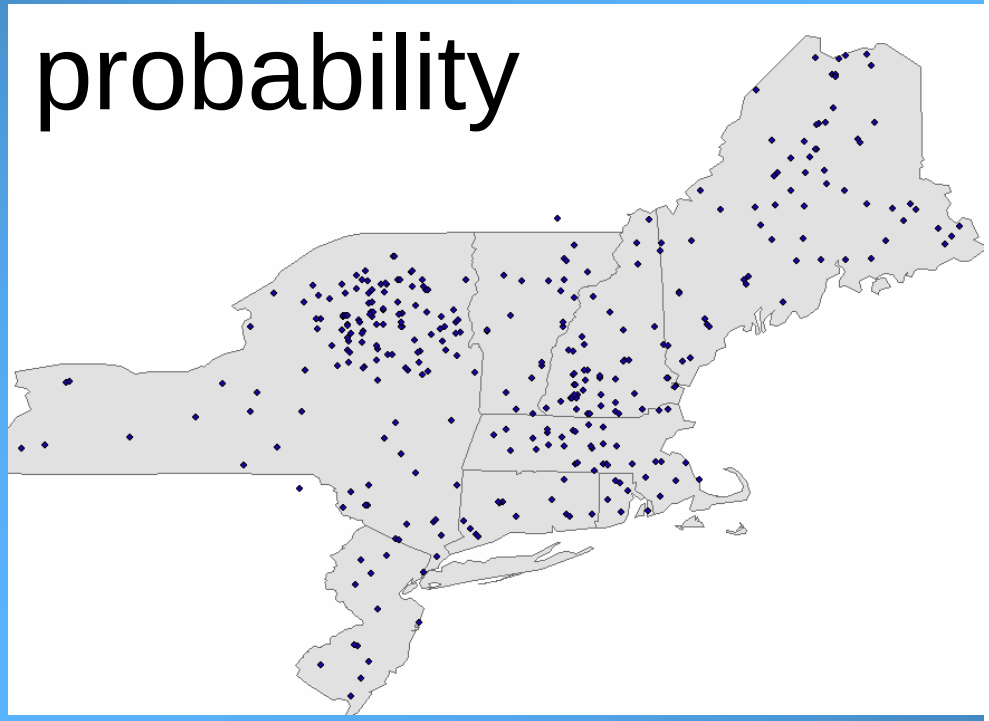
- Major lake surveys in New England
- Recent probability projects and their utility to States
- The New England Lakes Project
- N.E. State Perspectives on the NELAP
- Looking towards the National Lakes Program.

A brief history of major lake surveys in New England

- A Survey of Problem Lakes in the US (pre-1970)
- The National Eutrophication Survey (1970's)
- Northeast Lake Acidification Survey/PIRLA (early '80's)
- EMAP Northeast Lakes* ('91-'93)
- REMAP Survey of Hg in Fishes of Maine Lakes* ('92-'94)
- REMAP Survey of Hg in VT and NH Lakes* ('98-'00)
- National Fish Tissue Study*
- New England Regional Lakes Project* ('05-'11)

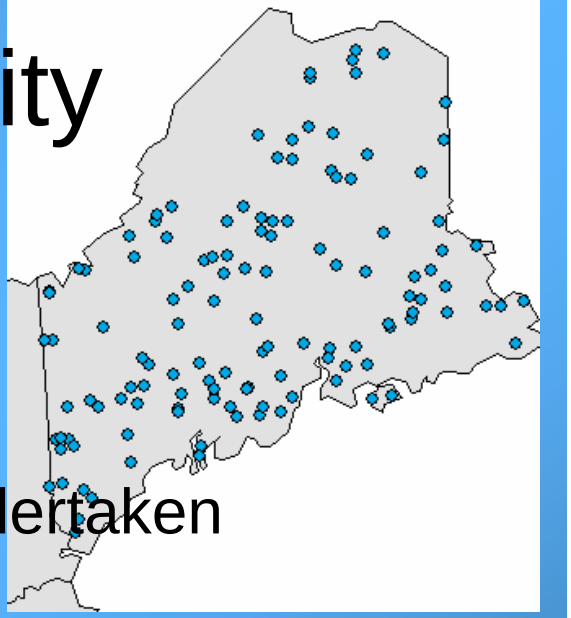
Projects may have had limited geographic scope, but had regional impact

Findings from the probability surveys



- EMAP
  - Assessment of trophic state, and of trophic change using paleolimnology
  - Initial highlight on fish contaminants
  - Assessment of zooplankton community responses to disturbance
  - Dataset provided “jump-off” point for so many research-based projects with wide and varied applicability.
  - EMAP-NE has proved a gold mine to the mercury research community

Findings from the probability surveys



- Maine REMAP
  - First random-probability lake survey undertaken by a northeast State.
  - Project looked specifically at fish mercury
  - Exposed the fish-mercury problem to all of the Northeast.
  - Provided data for New England's first mercury-specific fish consumption advisory.
  - Spawned numerous other research projects, in Maine and elsewhere

Findings from the probability surveys

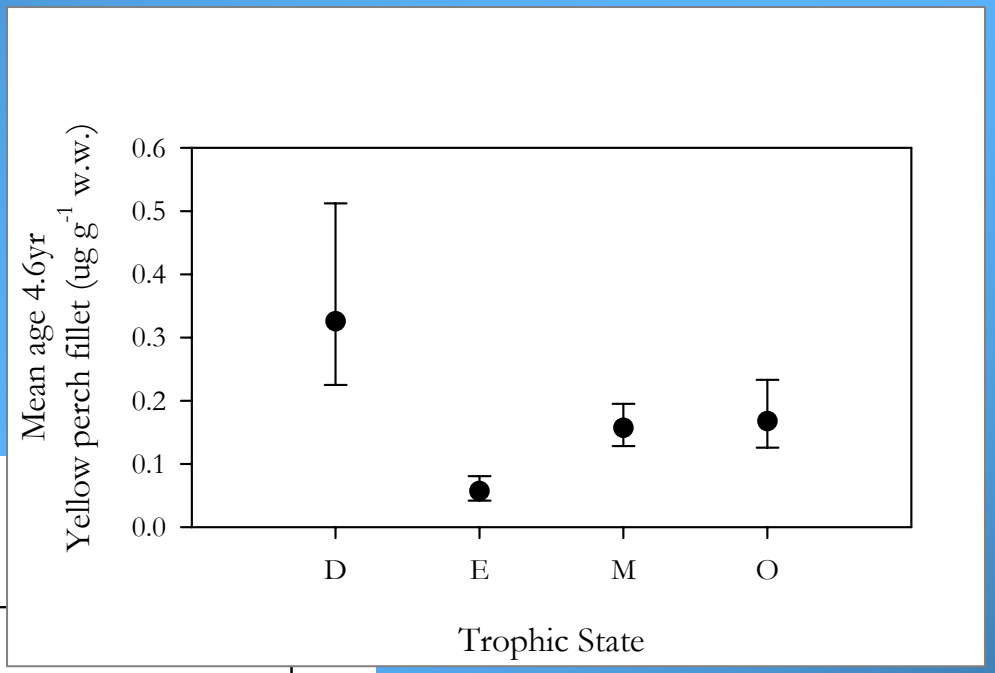
- VT-NH REMAP
  - First large-scale random probability survey to look at mercury and methylmercury across the food web as well as water and sediment
  - Verified the mercury bloom dilution hypothesis

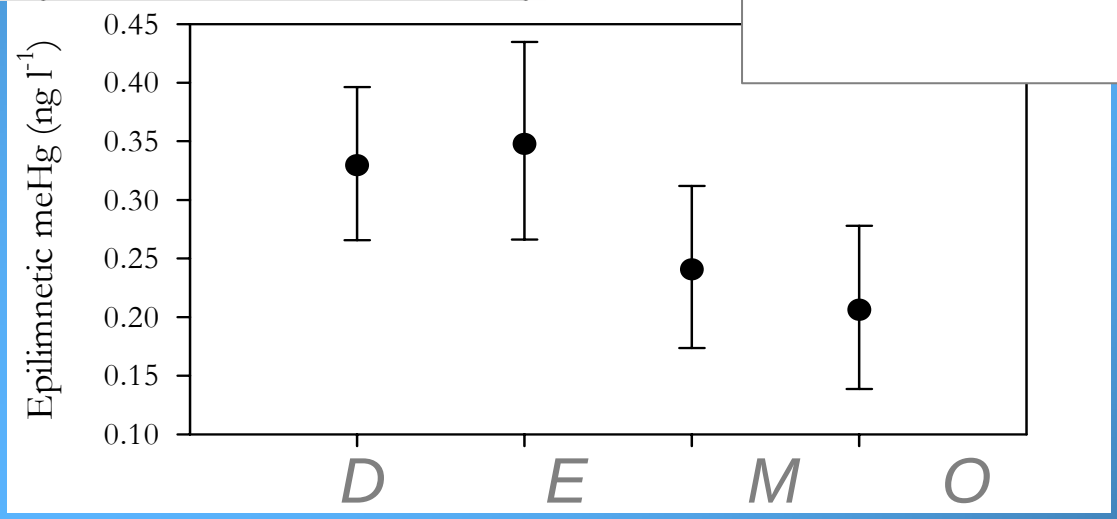
More algae means < Hg cell;

< Hg per cell means < Hg per bite of algae for zooplankton

< Hg per bite of zoop. means less efficient bioaccumulation to fish

Effect of bloom dilution



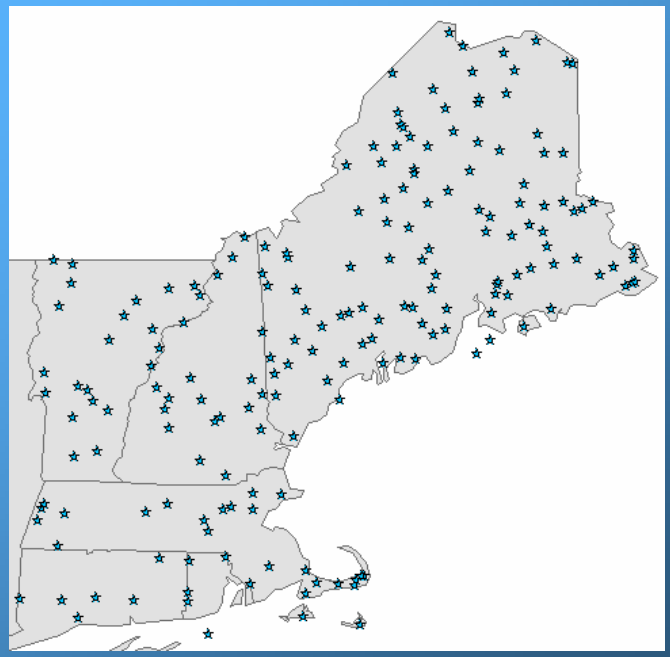


The New England Lakes and Ponds Project

- **U.S. Environmental Protection Agency**
- **NEIWPCC** (New England Interstate Water Pollution Control Commission)
- **New England States** (Maine, Vermont, New Hampshire, Massachusetts, Connecticut)

Design

- 300 lakes across region
- Random selection stratified on lake size
- Selection weighting adjusted to permit an even number of lakes amongst States
  - E.g., it is a collection of state “draws” within a regional “draw”
- Designed in collaboration with New England State lake managers and academic experts.



Modules

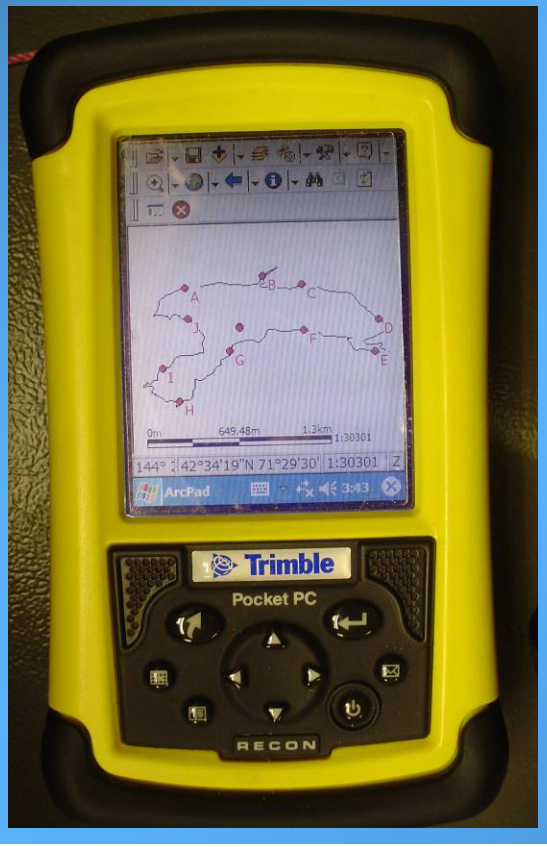
- Water chemistry/multiprobe profile
  - standard limnological parameters + ICPMS metals
  - chl-a by membrane and SCUFA™
- Sediment
  - bulk chemistry
  - “before and after” paleo
- Macrophyte transects (by underwater video)
- Crayfish (native vs. non, contaminants, stresses on fish populations)

Module: Fish Survey

- Electrofishing
- Standard observations
- Contaminants including Hg by “plug”
- Vitellogenin screening and EDC analyses

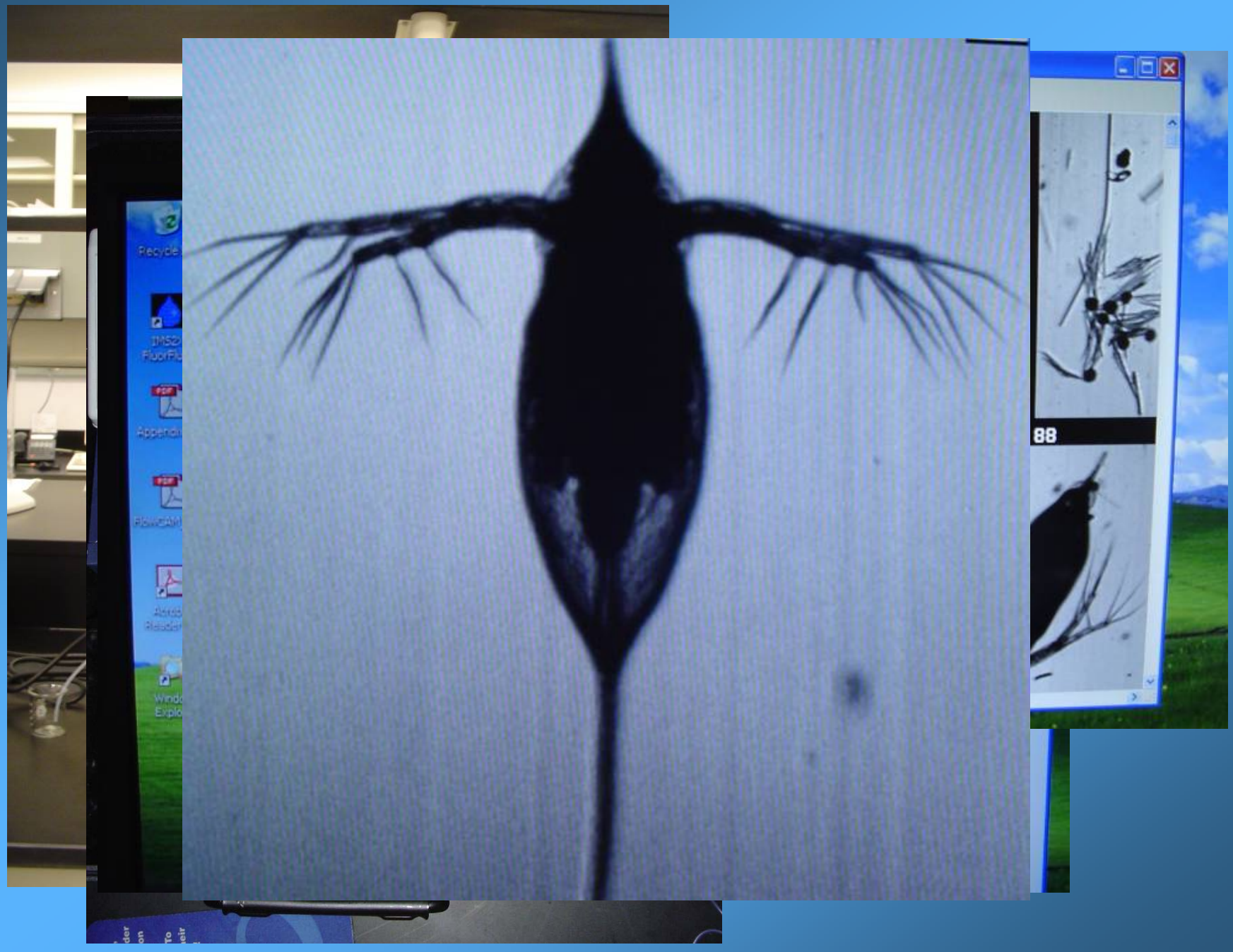
Module: Habitat Assessment

- 10 pre-selected random locations around the lake.



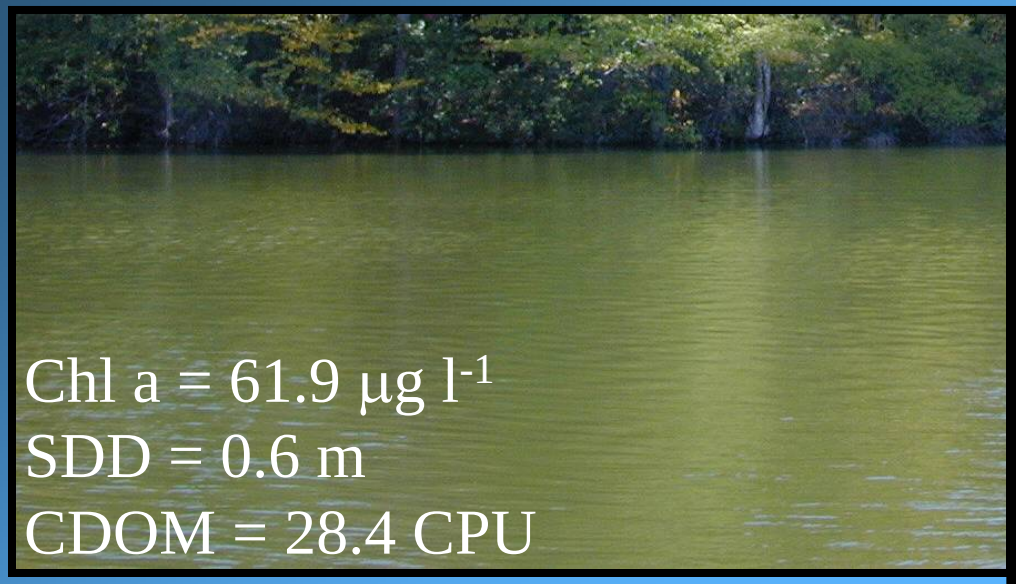
Module:
Zooplankton by flow-through cytometer; the FLOW CAM

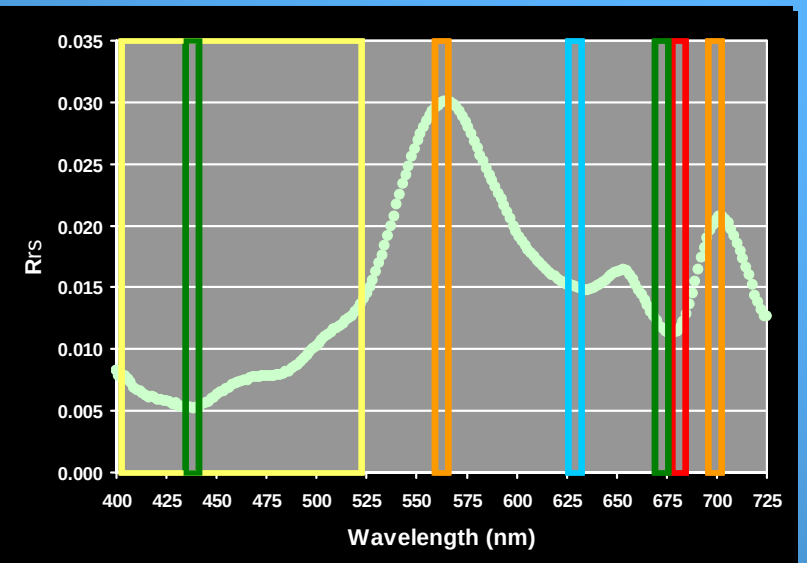
- Count & Identify zooplankton
- Identify size/length distributions of samples
- Images individual zoop’s, and sorts/groups images by length, aspect ratio, and diameter



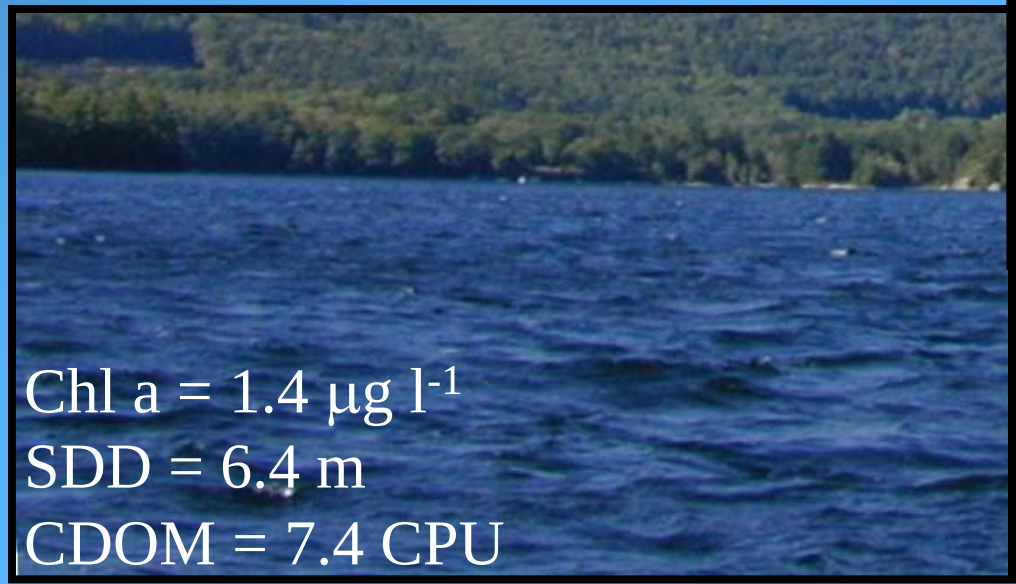
Module: In-situ hyperspectal imaging

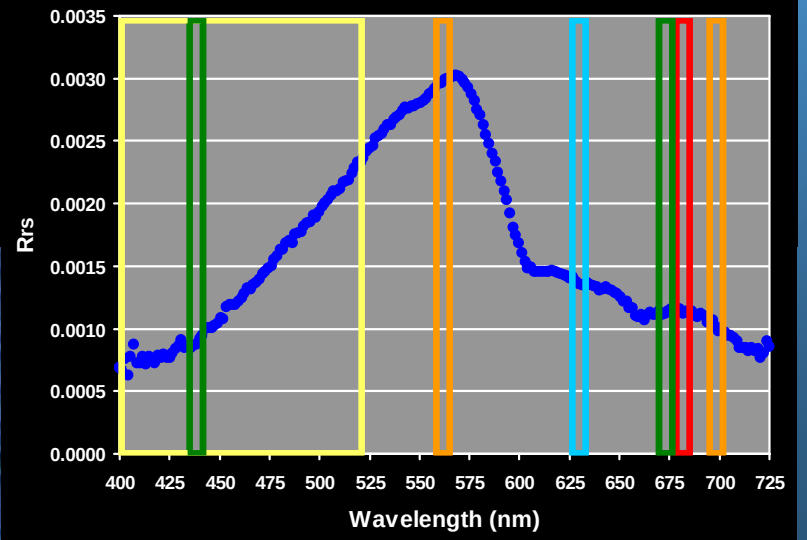
- Experimental module
- Relate aspects of lake productivity to watershed and chemical attributes
- A hybrid of traditional chemical sampling and particularly expensive remote sensing

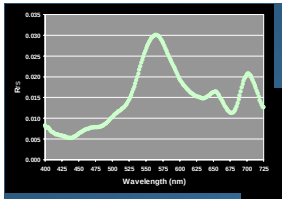




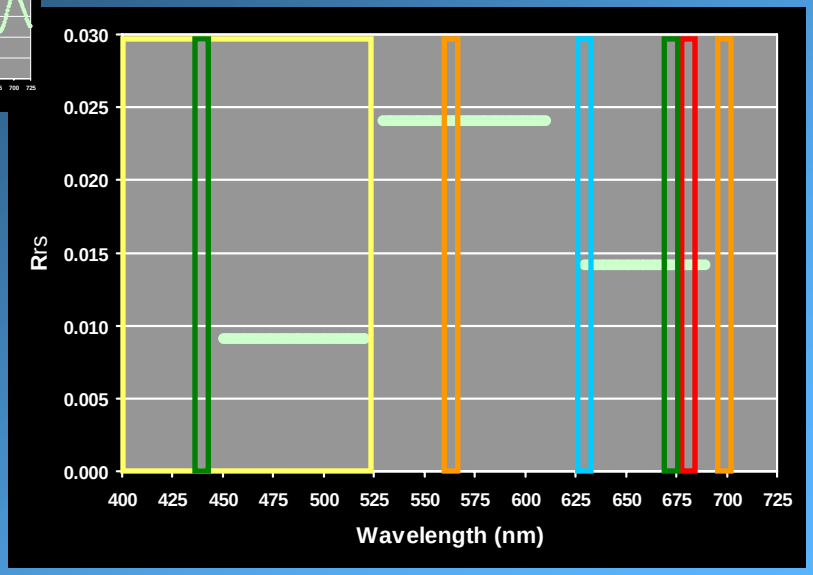
Chlorophyll *a*
CDOM
Scattering
Phycocyanin
Fluorescence

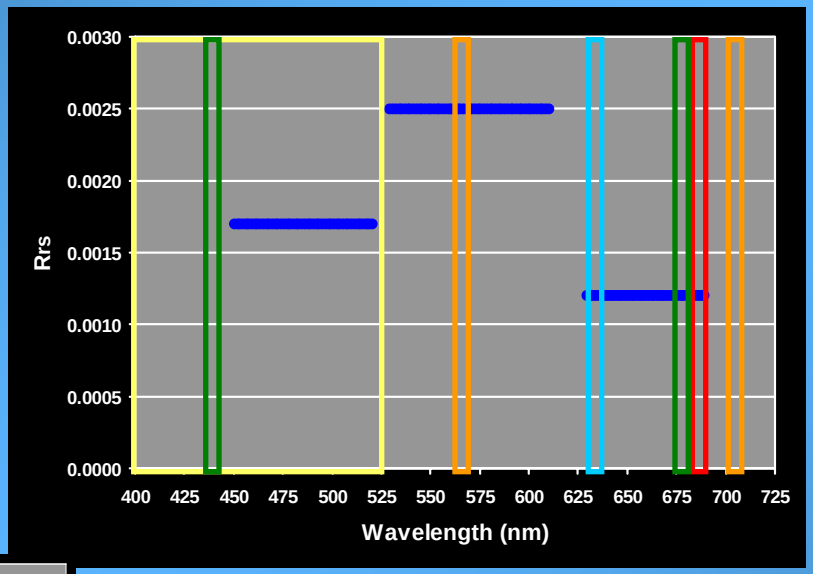




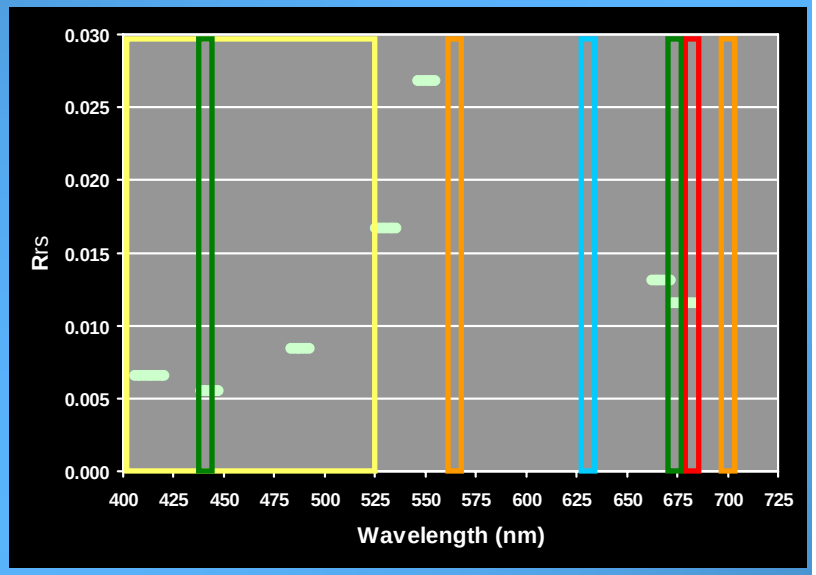


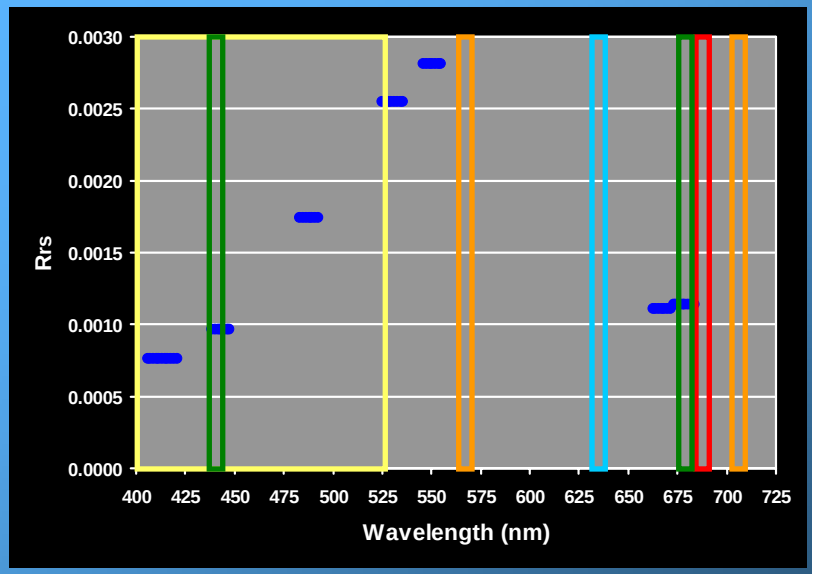
Landsat ETM+

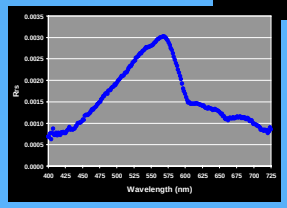




MODIS

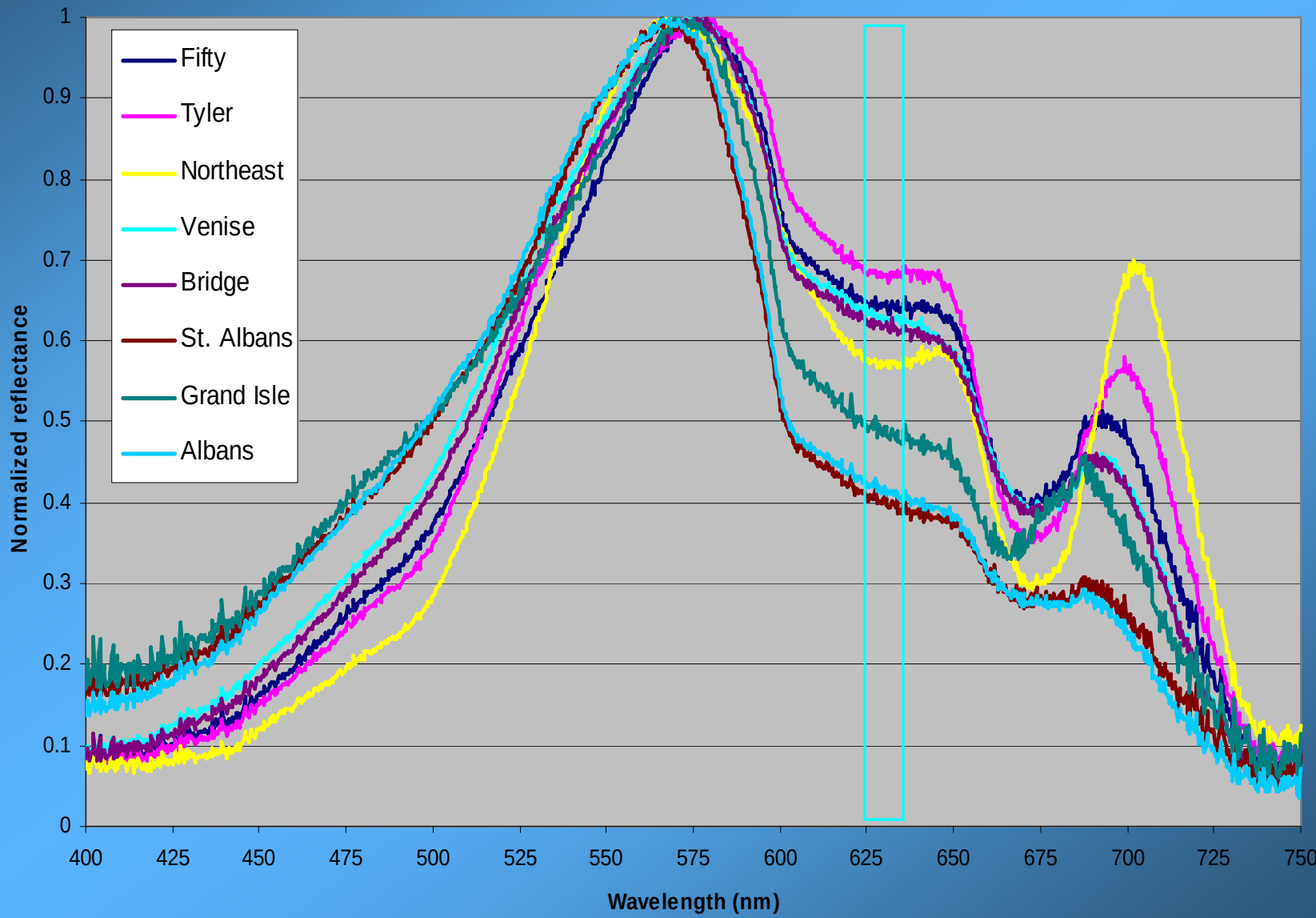






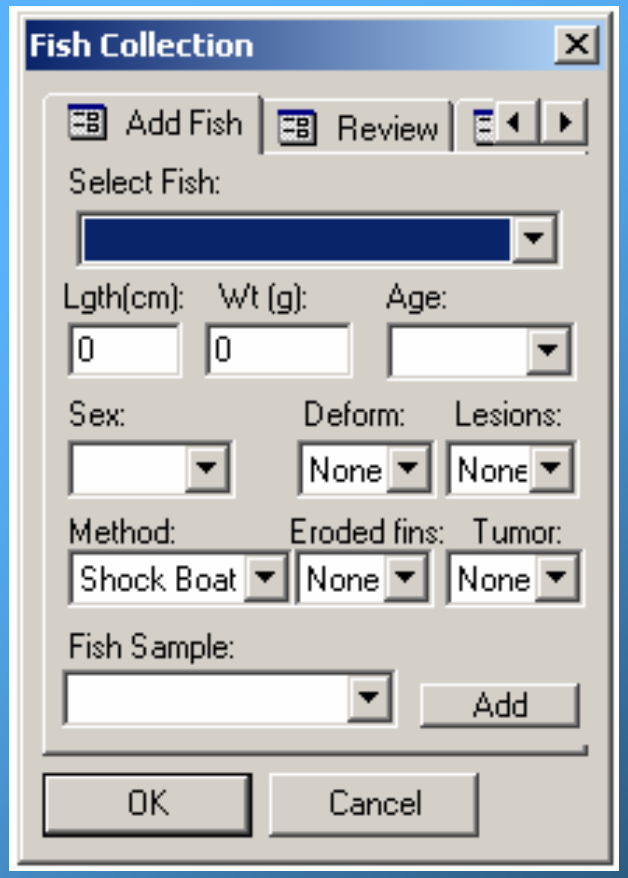
Chlorophyll *a* CDOM Scattering Phycocyanin Fluorescence

Test data – cyanobacteria in Lake Champlain



Electronic Data Collection

- To keep data consistent among partners, legible and organized



Milestone Hg Analyzer

- Fish tissue
- Plankton
- Crayfish

The Region's perspective

- Why State involvement is key:
  - In New England, resources and expertise is spread among the region
  - State's won't buy-in if they do not see value in the design
  - States bring other assets to the project

State perspectives ***Concerns***

- ***You want us to do what?!?***
  - Array of analyses sounds great on lakes that states *want* to sample, but this is a probability-based project.
  - Can this experimental information augment a States 305b reporting when it will be 5 more years for a complete project?
  - The data MUST be properly managed in a transparent fashion
  - There needs to be caution in regards to “over-collaborating.” If the project is designed to meet all needs, then most needs will not be met
  - No benthic macroinvertebrate bioassessment module

State perspectives ***Positives***

- ***We can do that??***
  - A large potential technology transfer might result from this project.
  - Wide agreement among states that the hyperspectal, flow-cam, fish EDC biomarkers, and habitat/fish assessment modules are new and promising – EPA is playing it's role well here.
  - Opportunity to sample 50 lakes per state, with some support for state staff to collaborate in the work
  - Before/after comparisons to EMAP-NE Lakes
  - Construction of a contemporary EMAP-NE lakes database for research and new discovery

State perspectives ***Volunteers***

- ***We want to do that!***
  - There is an important potential role for volunteers within the NELAP (and NLA)
  - Citizens may not sample lakes for the project, but…
  - Citizen organizations are where the action begins for improvement of waters.
  - Citizens need to know that NELAP (and NLA) is occurring, and how their data can inform interpretation of one-time sampling results.
  - Citizens deserve to know where the technology can be transferred into their own projects, and how their groups might leverage the new technology to answer questions at the local level.

On the National Lakes Assessment

- The new NELAP project methods should be strongly considered along with results of the NLA pilots for sampling modules.
- NLA project should be designed with two major goals in mind
  - Answer Congress' question
  - Give States tools (…to give to others)
- Stratification/selection should be tuned to meet the major goals, while maximizing the utility of the ultimate dataset to States and the citizens they serve.

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